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10CV71

**Seventh Semester B.E. Degree Examination, June/July 2015**  
**Environmental Engineering - II**

Time: 3 hrs.

Max. Marks: 100

**Note: 1. Answer any FIVE full questions.**  
**2. Relevant charts are permitted.**

- 1 a. Explain the need for good sanitation. Hence, describe types of sewerage system and their suitability. (06 Marks)
- b. Explain factors affecting DWF and the effects of flow variations on the design of sewerage systems. (07 Marks)
- c. A certain district of a city has a projected population of 50000 residing over an area of 40Ha. Find the design of discharge for the sewer line, for the following data :
- i) Rate of water supply = 200 lpcd      ii) Average impermeability factor for the area = 0.3      iii) Time of concentration = 50 minutes. The sewer line is to be designed for a flow equivalent to the WWF plus twice the DWF. Take sewage generated as equal to 75% of water supplied. Use the formula :
- $$R_i = \frac{25.4a}{t + b} \text{ . Comment on the result. (07 Marks)}$$
- 2 a. Explain the effect of flow variations on velocity of flow in sewers. (06 Marks)
- b. Explain i) self cleansing velocity      ii) Non – scouring velocity. (05 Marks)
- c. A 600mm diameter sewer is required to flow at 0.4 depth on a grade ensuring a degree of self cleansing equivalent to that obtained at full depth at a velocity of 850mm/s. Find the required grade, associated velocities and rates of discharge at full depth and 0.4 depth. Take  $n = 0.015$  for all depth of flow. [Given  $\frac{a}{A} = 0.374$  ;  $\frac{r}{R} = 0.857$  ]. (09 Marks)
- 3 a. Explain the need for providing sewer appurtenances in sewerage system. Hence name common sewer appurtenances. (04 Marks)
- b. What are inlets? Draw the locations and section of inlet and explain. (06 Marks)
- c. What is Manholes? Explain the need of manhole. Draw neat sketches of deep manhole. (10 Marks)
- 4 a. Differentiate between fresh sewage , stale sewage and septic sewage. (03 Marks)
- b. What is first stage BOD? Derive the equation for 1<sup>st</sup> stage BOD, with a neat sketch. (05 Marks)
- c. Explain COD and its relation with BOD. (04 Marks)
- d. What is Treatability Index? What is the use of treatability index? (08 Marks)
- 5 a. Explain various factors that affect self purifications process of stream. (07 Marks)
- b. Explain waste water disposal into sea. (05 Marks)
- c. 100m<sup>3</sup>/s of a city sewage is discharged in a river which is fully saturated with oxygen and flows at a minimum rate of 1250 m<sup>3</sup>/s, with a minimum velocity of 0.15m/s. If the 5 – day BOD of the sewage is 260 mg/lt, find where the critical DO will occur in the river. Take  $K_D = 0.11d^{-1}$  ,  $f = 4.0$ . Also ultimate BOD is 125% of 5-d BOD of the mixture of sewage and river water. DO saturated for river water = 9.17mg/lt. (08 Marks)



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- 6 a. Explain the importance of providing rocks and screens in a waste – water treatment plant. Draw a neat sketch of a bar – screen and explain the loss of head through the screen. (10 Marks)
- b. Write a note on grit – chambers. (05 Marks)
- c. What are skimming tanks? Explain with a neat sketch. (05 Marks)
- 7 a. Explain the biological treatment techniques for treating waste - water. (06 Marks)
- b. What are HRTF's? Explain importance of recirculations and its effect on the efficiency of HRTF's. (06 Marks)
- c. The MLSS concentration in an aeration tank is 2000mg/lt and the sludge volume after 30 minutes of settling in a 1000ml cylinder is 176ml. Calculate :  
i) SVI ii) SDI iii) Required return sludge ratio and iv) SS concentration in the recirculated sludge. (08 Marks)
- 8 a. What are stabilization ponds? Explain the algae – bacteria symbiosis in an oxidation pond with a neat sketch. (06 Marks)
- b. Explain the stages in anaerobic sludge digestion. (06 Marks)
- c. Draw a neat sketch of septic tank with soak pit. Write the design criteria required for septic tank. (08 Marks)

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